



Comparison of Different Reagents for the Enhanced DNAPL Remediation in Heterogeneous Porous Media

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The presence of chlorinated solvents in the subsurface in the form of dense non-aqueous phase liquids (DNAPL) often leads to long-term contamination of large portions of groundwater resources. In this study, reagent-enhanced remediation of DNAPL source zones is investigated. The laboratory-scale experiments focused on the recovery of pooled PCE entrapped in homogenous silica sand and natural calcareous soil using Tween 80, Sodium dodecyl sulfate (SDS), Methyl beta cyclodextrin (MCD) and water. Batch and 2-D flow-cell experiments were conducted to evaluate the performance of the different reagents within the two porous media. The batch tests revealed the behavior of the multiphase system and identified potential limitations of the different flushing solutions. The flushing experiments were evaluated both in terms of the effluent time-dependent concentration and mass flux reduction. The results showed that the performance of reagents for PCE source zone remediation was in the following order: Tween 80 > SDS > MCD > Water. Factors influencing the DNAPL recovery efficiency included the spatial distribution of the DNAPL, type and concentration of reagent, and the heterogeneity of the porous media. The implications of these findings on field remediation activities will be discussed. Overall, the experiments highlight the significance of site characteristics and the importance of selecting an appropriate flushing reagent for the development of effective DNAPL remediation strategies.